REMARKS

Claims 1-12 and 14-24 are pending. By this Amendment, the specification is amended; claim 13 is canceled without prejudice or disclaimer; and claims 1-7, 12 and 22-24 are amended. Reconsideration in view of the above amendments and following remarks is respectfully requested.

Claims 1, 2, 4, 6, 8-21 and 24 were rejected under 35 U S.C. §102(e) by Bajt et al. (U.S. Patent Application Publication 2003/0008180 A1). The rejection is respectfully traversed.

Claim 1 recites a lithographic projection apparatus including, *inter alia*, at least one optical element on which a beam of radiation is incident having a Si/Mo mutilayer structure, a capping layer, and an interlayer. The interlayer includes C or Mo positioned between the multilayer structure and the capping layer. The interlayer has a thickness greater than 7.0 nm and up to 9.0 nm.

Bajt et al. disclose optimized capping layers for EUV multilayers. A multilayer coating 16 of Mo and Si or Mo and Be is provided on a substrate 22. An overcoat bilayer 10 includes a top layer 14 and a bottom layer 12 and is deposited on the multilayer coating 16. The bottom layer 12 of the overcoat bilayer 10 comprises a material that prevents diffusion of the top layer 14 into the top layer 18 of the multilayer coating 16. See paragraph [0024].

In the embodiment shown in Figure 2 of Bjat et al., the diffusion layer 30 is formed of Mo and is 1.3 nm thick. See paragraph [0026]. In the embodiment shown in Figure 4A the diffusion barrier layer 40 is B_4C and is also about 1.3 nm thick. See paragraph [0027]. In the embodiment shown in Figure 4B, the top Si layer of the Si/Mo multilayer structure is entirely replaced with a B_4C diffusion layer 50. See paragraph [0027].

Bajt et al. disclose that experiments were conducted to explore how far the thickness of the B_4C diffusion barrier layer could be reduced to provide the optimal thickness in a trade off between reflectance and interdiffusion. The experimental data obtained by Bajt et al. is shown in Figure 5 and clearly shown that the reflectance sharply decreases as the B_4C diffusion barrier layer thickness becomes greater than about 2 nm.

As disclosed, for example, in paragraphs [0035] and [0036], of the instant application, previously used interlayers were thin because it was desired to maintain the reflectivity of the optical element as high as possible. It was thought that the trend in reduction in reflectivity

with an increase in the thickness of the interlayer observed at thickness in the range of 1.0 to 2.5 nm continued at higher thicknesses. Applicants discovered, however, that a second peak in reflectivity occurs for Mo interlayer thicknesses between 6.0 to 9.0 nm. This discovery is shown in Figure 2B. Although the reflectivity at such thicknesses of the interlayer is lower than for thinner interlayers, the reduction in reflectivity is tolerated because of the improvements in oxidation resistance which are achieved by a Mo interlayer of thickness between 6.0 to 9.0 nm.

As shown in Figures 3B and 4B of the instant application, for example, this second peak in reflectivity also occurs for interlayers formed of C and for interlayers formed of Mo and C.

There is no disclosure or suggestion by Bajt et al. of an interlayer having a thickness greater than 7.0 and up to 9.0 nm as recited in claim 1. As discussed above, the diffusion barrier layers disclosed by Bajt et al. generally have a thickness of 1.3 nm, as shown in Figures 2 and 4A and as discussed in paragraphs [0026] and [0027], and Bajt et al. disclose that the diffusion barrier layer should be reduced in thickness. See paragraph [0027] and [0032]. Although Bajt et al. disclose in paragraph [0033] that the thickness of each layer 12 and 14 in the overcoat bilayer 10 may be in the range of 0.5 to 7 nm, as clearly shown in Figure 5 of Bajt et al., there is no recognition of the second peak in reflectivity as discovered by Applicants. Therefore, it is respectfully submitted that there is no suggestion by Bajt et al. of an interlayer thickness in the range recited in claim 1.

Claims 2-11 recite additional features of the invention and are allowable for the same reasons discussed with respect to claim 1 and for the additional features recited therein.

Claim 12 recites a lithographic projection apparatus including, *inter alia*, at least one optical element on which a beam of radiation is incident having a Si/Mo multilayer structure. A capping layer, and an interlayer positioned between the multilayer structure and the capping layer. The interlayer includes an inner interlayer comprising Mo next to the multilayer structure and an outer interlayer comprising C next to the capping layer. The outer interlayer C has a thickness greater than 3.4 nm or the capping layer has a thickness greater than 2.0 nm and the combined thickness of the inner and the outer interlayers is greater than 7.0 and up to 9.0 nm.

There is no disclosure or suggestion by Bajt et al. of inner and outer interlayers having a combined thickness greater than 7.0 and up to 9.0 nm. As discussed above, Bajt et al. only

disclose that the diffusion barrier layer of the overcoat bilayer may have a thickness between 0.5 and 7 nm. Accordingly, Bajt et al. cannot anticipate or render obvious claim 12.

Claims 14-21 recite additional features of the invention and are allowable for the same reasons discussed above with respect to claim 12 and for the additional features recited therein.

Claim 22 recites a device manufacturing method including, *inter alia*, projecting a beam of radiation after it is patterned using at least one optical element on which the beam is incident, wherein the at least one optical element has a Si/Mo mutilayer structure, a capping layer, and an interlayer including C or Mo positioned between the multilayer structure and the capping layer, the interlayer having a thickness greater than 7.0 and up to 9.0 nm.

As discussed above there is no disclosure or suggestion by Bajt et al. of an interlayer having a thickness greater than 7.0 and up to 9.0 nm. The diffusion barrier layers of the embodiment disclosed by Bajt et al. are between 0.5 and 7 nm.

Claim 23 recites a device manufacturing method including, inter alia, using at least one optical element on which a beam of radiation is incident, the at least one optical element having a Si/Mo multilayer structure, an outer capping layer and an interlayer positioned between the multilayer structure and the outer capping layer. The interlayer includes an inner interlayer including Mo next to the multilayer structure and an outer interlayer including C next to the capping layer. The outer interlayer has a thickness greater than 3 4 nm or the capping layer has a thickness greater than 2.0 nm and the combined thickness of the inner and outer interlayers is greater than 7.0 and up to 9.0 nm.

Bajt et al. do not disclose or suggest an interlayer including a inner interlayer and a outer interlayer having a combined thickness of greater than 7.0 and up to 9.0 nm. The diffusion barrier layers of Bajt et al. are between 0.5 and 7 nm.

Claim 24 recites an optical element for use in a lithographic projection apparatus including a Si/Mo multilayer structure, a capping layer, and an interlayer positioned between the multilayer structure and the capping layer. The interlayer includes one of a layer including C or Mo having a thickness greater than 7.0 and up to 9.0 nm or an interlayer including Mo next to the multilayer structure and an outer interlayer including C next to the camping layer, the outer interlayer having a thickness greater than 3.4 nm or the capping layer having a thickness greater than 2.0 nm and the combined thickness of the inner and outer interlayers being greater than 7.0 and up to 9.0.

Bajt et al. do not disclose or suggest either of the interlayers recited in claim 24. The diffusion barrier layers of Bajt et al. are between 0.5 and 7 nm.

Reconsideration and withdrawal of the rejection of claims 1, 2, 4, 6, 8-21 and 24 over Bajt et al. are respectfully requested.

Claims 3, 5, 7, 22 and 23 were rejected under 35 U.S.C. §103(a) over Bajt et al. The rejection is respectfully traversed.

The Office Action on page 3, paragraph number 6, alleges that although Bajt et al. do not disclose the claimed thickness of the interlayer and the capping layer, that one of ordinary in the art at the time the invention was made would have adjusted the thickness of the layers accordingly, possibly using a range outside the 0.5 to 7 nm range recited in paragraph [0033] in Bajft et al.

It is respectfully submitted that one of ordinary skill in the art would not have been motivated by the disclosure of Bajt et al. to use an interlayer having a thickness greater than 7.0 nm, as recited in each of the independent claims of the application. As discussed above, Bajt et al. clearly disclose in paragraph [0027] that experiments were conducted to determine how far the thickness of the B_4C diffusion barrier layer could be reduced. As shown in Figure 5, there is no recognition by Bajt et al. of a second peak in reflectivity for the diffusion barrier layer at thickness greater than 7.0 nm. As clearly shown in Figure 5, Bajt et al. disclose that the reflectivity decreases steadily from approximately 2 nm. There is no recognition of a second peak in reflectivity. As shown in Figure 6, Bajt et al. disclose that the highest reflectivity is obtained with a diffusion barrier layer of B_4C of 0.6 nm. See also paragraph [0027]. Accordingly, it is respectfully submitted that one of ordinary skill in the art would not have been motivated by the disclosure of Bajt et al. to adjust the thickness of barrier layer to be greater than 7.0 nm.

Reconsideration and withdrawal of the rejection of claims 3, 5, 7, 22 and 23 under 35 U.S.C. §103(a) over Bajt et al. are respectfully requested.

In view of the above amendments and remarks, Applicants respectfully submit that all the claims are allowable and that the entire application is in condition for allowance.

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Should the Examiner believe that anything further is desirable to place the application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed.

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